

froze as it fell. Telegraph wires were prostrated and communication was cut off. At San Antonio, Tex., heavy rain, with thunder, began at 7.45 a. m. Hail the size of chestnuts fell, breaking window glass. A severe storm moving north-east was reported at Cape Girardeau, Mo., in the morning.

21st-24th.—Heavy rain and gales prevailed on the Pacific coast, causing an immense amount of damage. A description of the floods resulting from the rainfall will be found under the heading "Floods." At San Francisco, Cal., rain began 10.30 a. m., 21st, and continued at intervals during the 22d. During this period the wind blew a gale, reaching a velocity of 50 miles per hour the night of the 22d, when the Signal Office anemometer cups were blown away. The ship "Elizabeth" was wrecked about 4 miles outside the Golden Gate, near Rocky Point, the evening of the 21st. The ship went to pieces soon after striking the rocks, and 18 of the 29 persons on board were drowned. The life-saving crews and tug tried to save the ship and the persons on board, but owing to high wind little or nothing could be done. The captain of the life-saving crew was drowned. Much damage was done about the city and harbor by high wind. Some new and unfinished buildings were blown down, several barges were sunk, and telephone and telegraphic communication was almost entirely suspended. At Sacramento, Cal., high south winds prevailed on the 22d, and the barometer fell to 29.10, the lowest ever noted at that place. At Eureka, Cal., the barometer stood at 29.06 at 10 p. m. of the 21st, with wind blowing a gale from the southeast. At 8 p. m. of the 22d the barometer fell to 28.97, the lowest ever recorded at that place. At Roseburgh, Oregon, rain and heavy, moist snow alternated during the 22d, prostrating electric wires, and on the 24th rain fell at intervals, and washouts were reported on railroads to the southward. On the 23d, between 1 and 2 a. m., a heavy wind and hail storm at Berkeley, Cal., uprooted trees and stripped them of their branches. At San Diego, Cal., rain began in the early morning of the 22d and continued all day, with steady south to southeast wind. Heavy rain continued nearly all night of the 22-23d. On the 24th a heavy shower of rain fell in the afternoon. At Red Bluff, Cal., a southeast gale, with rain, prevailed from midnight to 3.30 a. m. of the 23d. At Olympia, Wash., light snow fell on the 23d, and the barometer fell to 29.00, the lowest since 1880. At Winnemucca, Nev., a south gale began 1.15 a. m., 23d, with maximum velocity 40 miles per hour. Rain began 4.45 a. m., and changed to moist snow, which ended 10.15 a. m. The gale ended 6.30 a. m. A second gale began shortly after noon, with sleet and snow squalls, and maximum wind velocity 58 miles per hour from the sw. The storm ended 11 p. m. Sheds were blown down and panes of glass blown in. At Keeler, Cal., high s. winds prevailed on the 23d, with rain in the morning. At 8 a. m. the barometer read 29.15, the lowest recorded at the station. Disastrous floods prevailed in west Arizona from the 22d to the close of the month. At Farley's Camp, Ariz., 4.00 inches of rain were reported in 9 hours on the 23d. A report from Cottonwood, Ariz., dated the 23d, stated that it had rained steadily for 6 days at that place. At Los Angeles, Cal., the barometer fell during the night of the 22-23d, with brisk s. to se. winds and rain, which fell heavily at times. At 8 a. m., 23d, the barometer read 29.50, corrected, the lowest reading recorded during a winter storm; the lowest barometer previously recorded being 29.52 during the great storm of February, 1884. An immense amount of damage was caused in that region by floods and freshets.

22d.—A storm, with thunder and lightning, moved ne. over Sunbury, N. C., at 10.30 a. m., eastern time, killing one child and doing about \$4,000 damage to property.

24th.—At 4.45 p. m., central time, a tornado moved north-east over Troy, Mo., and traveled about 6 miles in a direct line. Path of greatest destruction about 200 yards in width. Damage to buildings \$2,000 to \$2,500. Light rain fell just before the passage of the storm. The main part of the funnel seemed to be about one-half mile high, with a long, kite-like tail which hung down towards the earth. At West Bend, Iowa, a thunder-storm began about 6 a. m., and at 9 a. m. the wind changed to nw. and blew hard all day. The temperature fell 40° in 24 hours. At Manson, Iowa, high temperature and thunder and lightning prevailed in the early morning. The wind suddenly veered to w. and nw., reaching 35 to 40 miles per hour, with light snow, and the temperature fell 46° in 8 hours. At Amana, Iowa, the temperature was very high in the morning; at 2 p. m. the wind veered to w., and in 6 hours the temperature fell 31°, with wind blowing hard from the nw. At midnight a tornado moving e. was reported at Utica, Ind. The storm had a whirling motion from s. to e. and was attended by a continuous glare of lightning. Timber and other articles were carried up. All trees blown down were lying in an easterly direction, and some trees had the tops torn off. The path of greatest destruction was about 100 feet in width and passed through the centre of the town, where buildings were damaged to the extent of about \$6,000. Large timber was carried up by the storm and driven through the sides of houses. At Jeffersonville, Ind., a bell tower and a few trees were blown down in the eastern part of the city. About midnight, central time, a storm passed ne. over Newcastle, Ky., with very heavy thunder, lightning, small hail, and heavy rainfall following. A roaring sound was heard, and timbers were carried some distance. The path of heaviest wind was about 50 yards in width; buildings were damaged to the extent of about \$2,000. At Louisville, Ky., a heavy thunder-storm occurred the night of the 24-25th, with heavy rain and violent winds, the highest velocity, 40 miles per hour, occurring shortly after midnight. Much damage was caused to chimneys, etc.

25th.—A dust storm prevailed at Abilene, Tex., in the afternoon. The wind shifted to n., and reached 52 miles per hour. The instrument shelter of the Signal Office was carried away, some outhouses blown down, and other damage caused.

26th.—At Cape Henry, Va., a severe gale prevailed, with maximum velocity 54 miles per hour from the nw. at 5.22 p. m. Rain, with snow squalls, occurred in the evening. All vessels were compelled to seek shelter in Hampton Roads. At Jacksonville, Fla., a w. gale prevailed, with light rain in the morning. The wind reached a velocity of 56 miles per hour at 3.50 p. m. This velocity has been exceeded but once at that station, in March, 1872, when the wind reached 58 miles per hour from the ne. A number of houses and electric wires were damaged.

28th.—A heavy thunder-storm, with rain changing into snow, prevailed over southeast Massachusetts. At Wellfleet a church was struck by lightning and burned. At Truro the signal station was struck by lightning and set on fire. At Cape Cod Light station articles in the dwelling were torn to pieces and the keeper's wife was stunned. At New Bedford a heavy wind, thunder, rain, and snow storm occurred in the evening. At Smith's Neck, Misham Point, South Dartmouth, Martha's Vineyard, and on Elizabeth Islands, and at other points, buildings were struck by lightning and burned.

INLAND NAVIGATION.

FLOODS.

On the 2d the Ohio River was rising rapidly at Cincinnati, Ohio, and Louisville, Ky. At Cincinnati the river was 38.9 feet on the gauge at 7 a. m., a rise of 13.9 feet in 48 hours.

This almost unprecedented rise was due to sudden outpours from the Little Miami and Licking rivers. During the day the river rose at the rate of 0.2 foot per hour. At Louisville the water was 16.6 feet in the canal at 5 p. m. On the 3d the

river had risen to 43.2 feet at Cincinnati. At Louisville the river continued to rise and at 5 p. m. there was a depth of 20.3 feet in the canal. The Tennessee River was rising at Chattanooga, Tenn. On the 4th the river reached the danger-line, 45.0 feet, at Cincinnati at 1 a. m.; at 7 a. m. it stood at 45.6 feet; and at 10 a. m. at 46 feet. At Louisville the depth of water in the canal at 5 p. m. was 21.3 feet. At Chattanooga, Tenn., the Tennessee River was rising at the rate of more than 0.1 foot an hour. On the 5th the river at Cincinnati reached 47.5 feet at 7 a. m., and 47.8 feet at 7 p. m. At Louisville there was a depth of 22.2 feet in the canal at 5 p. m. The Tennessee River continued to rise at Chattanooga. On the 6th the river at Cincinnati reached its highest point, 47.9 feet, in the early morning. At 10 a. m. it stood at 47.8 feet, and at 4 p. m. at 47.6 feet. At Louisville 22.9 feet was reached. On the 7th the river was falling at Cincinnati and at all points above. At Louisville it was stationary at 22.8 feet. On the 8th the river was falling at Louisville. On the 9th the Tennessee River began to rise at Chattanooga at 9 a. m., and rose rapidly the balance of the day. On the 10th the river continued to rise at Chattanooga, and persons living below the danger-line were moving to higher ground. A large boom on the Little Tennessee, near Lenoir's, containing over 4,000,000 feet of logs, and valued at \$80,000, broke the night of the 9-10th. The Tennessee River rose rapidly at Knoxville, Tenn. On the 11th the river rose rapidly at Chattanooga, Tenn. At Knoxville the river rose to 21.9 feet at 8 a. m., and then commenced to fall.

On the 11th and 12th freshets were reported in the Broad River, North Carolina. On the 12th the Ohio River was rising slowly at Cincinnati, and was near the danger-line. The river rose slowly at Louisville, and at 5 p. m. there was a depth of 20.8 feet in the canal. The Tennessee River continued to rise at Chattanooga, and portions of the city were flooded; at 5 p. m. the water was 2.5 feet above the danger-line. At Knoxville the river was falling. On the 13th the river reached 46.3 feet at Cincinnati at 7 a. m., after which time it fell rapidly. At Cairo, Ill., the river reached the danger-line, 40 feet, flooding bottom lands. At Chattanooga the Tennessee River continued to rise; traffic on mountain railroads was stopped; and the country between Lookout Mountain and Missionary Ridge was submerged. On the 14th the river at Chattanooga was nearly stationary at 37.5 feet at 7 a. m.; it reached 37.55 feet at 7.30 a. m.; remained at that height until 10 p. m., after which it began to fall. On the 15th the Cumberland River was above the danger-line, 40 feet, at Nashville, Tenn. On the 15th, 16th, and 17th heavy rainfall was reported at the headwaters of the Allegheny and Monongahela rivers.

On the 16th the Conemaugh River rose to an alarming height at Johnstown, Pa., by noon, and from that time the water rose 1.0 foot an hour; public schools were dismissed and the Cambria Iron Works were closed; by 3 p. m. many streets were flooded, and at night one-half the city was under water. Streams in east Ohio and West Virginia rose rapidly, causing great damage. At Cincinnati, Ohio, the river rose to 45.8 feet at 4 p. m.; Mill Creek was very high, and bridges were carried away. At Red Bluff, Cal., streets were flooded, and the river reached 15 feet at noon, 15th, a rise of 7 feet in a few hours. Much damage was caused by flood in Butte county, Cal., by the overflow of the Sacramento River. On the 17th the rivers were rising at Pittsburgh, Pa., and passed the danger-line. At 11 p. m. the river stood at 29.9 feet on the gauge, 7.9 feet above the danger-line. Portions of the 1st, 4th, and 8th wards, Allegheny City, were flooded, and travel on the street railroad between Pittsburgh and Allegheny City was suspended at 4.30 p. m.

At Parkersburgh, W. Va., the river rose 11 feet in 24 hours. At Cincinnati, Ohio, a steamboat was wrecked by colliding with a pier of the bridge. Two passengers were killed, 3 injured and 2 were missing. The accident was in a measure due to the unusually swift current. At Louisville the river was rising slowly. A flood prevailed in the West Branch of

the Susquehanna River, Pa. At Harrisburg, Pa., the Susquehanna River rose rapidly. On the 18th streams flooded their banks, causing much damage to bridges and mountain roads about Blue Knob, Pa. At Pittsburgh, Pa., the river reached 31.3 feet on the gauge at 6 a. m.; it remained stationary until 10 a. m., when it began to fall. The marks on the 7th street bridge across the Allegheny River showed 32 feet in the early morning; with the exception of the flood of February 6, 1884, this was the highest stage of water noted at that point since the observations began. Streets in low-lying parts of Pittsburgh and Allegheny City were flooded. At Wheeling, W. Va., the river stood at 43.8 feet at 6 p. m., and was rising 4 inches an hour. All railroads suspended operations, and streets and houses were flooded. At Parkersburgh, W. Va., the river rose 7.5 feet in 24 hours, and damage by flood was threatened. Owing to heavy rain streams were rising rapidly and overflowing in Arizona. The telegraph line between San Carlos and Fort Thomas was rendered useless by the tripods being washed out in the Gila River, letting the line into the water. A report from Globe stated that a disastrous flood occurred at that place, sweeping away over 20 houses and drowning one man. At Fort Apache the river was very much swollen, and the roads were almost impassable. At Tip Top Cottonwood Creek was the highest ever known, and houses, roads, etc., were washed away. The Little Colorado River was very high at Holbrook. Near Whipple Barracks (Prescott) railroad bridges were carried away. At Yuma rain fell at intervals, and washouts occurred along the railroad.

On the 20th the Susquehanna River was 2 feet above the danger-line at Harrisburg, Pa., and it had risen 5 feet during the preceding night. Much damage was caused in low-lying parts of the city. Flood caused great damage in Venango county, Pa. The river was falling slowly at Pittsburgh, Pa. The river stood at 41.4 feet on the gauge at Parkersburgh, W. Va., at 8 a. m.; all railroad trains were abandoned in that region, and Riverside was under water. At Wheeling, W. Va., the river fell slowly. At Cincinnati, Ohio, the river began to rise slowly. At Tiffin, Ohio, the Sandusky River was higher than at any time during the past winter. At Louisville, Ky., the river was falling rapidly. Drift-wood was reported in the Mississippi River at New Orleans, La. Destructive floods continued in Arizona. At Simmons the flood was reported the most extensive in 21 years. The river was very high at Fort Thomas. Flood conditions prevailed along the Little Colorado River at Holbrook. At Fort Apache roads were impassable for wagons. On the 20th the Susquehanna River fell 1 foot at Harrisburg, Pa. At Parkersburgh, W. Va., the river continued to rise, causing heavy loss in low-lying districts. At midnight the water was 44 feet 10 inches; with the exception of the flood of February, 1884, when the water reached 54 feet 2 inches, this stage was the highest noted at that place in 60 years. The Monongahela and Allegheny rivers were rising. At Cincinnati, Ohio, the river reached 45 feet, the danger-line, at 11 a. m. Rivers and streams continued high in Arizona. On the 21st the river was falling at Parkersburgh, W. Va. At Cincinnati, Ohio, the river reached 50 feet at 8 a. m. At 8 p. m. it reached 52.2 feet and was rising 0.1 foot an hour. The lower floors of houses at low points on the water front were submerged. Up-river boats had not made trips for two days. At Louisville, Ky., the river rose rapidly, reaching 22 feet in the canal at 5 p. m. Small streams were out of their banks in central Indiana. The Tennessee River rose at Chattanooga, Tenn., from the 21st to 25th. Rivers continued high in east Arizona.

On the 22d the river rose steadily at Cincinnati, Ohio, reaching 54.8 feet at midnight. Parts of Cincinnati and Newport, Ky., and the Mill Creek and Little Miami bottoms were flooded. All large steamboats were tied up. At Louisville, Ky., the river reached 25.6 feet, 1.6 foot above the danger-line. Streams were high and flooding their banks in Indiana, Illinois, and Missouri. The Mississippi River reached a dangerous height at Natchez, Miss. Heavy rain storms and floods pre-

ailed in Arizona. The Salt River flooded its banks in Maricopa county, doing great damage near Phoenix; the Little Colorado was high at Holbrook, and the Gila River at San Carlos. At Yuma the river rose rapidly, the rise, at times, being at the rate of 1 foot an hour. At noon the backwater from the Gila River reached a dangerous height. About 8 p. m. the levee broke, and a large body of water poured through that portion of the town east of Main street, and half an hour later that street was covered with about 4 feet of water, and houses were being undermined and demolished. By 9 p. m. fully one-half of the houses in the town were in ruins and hundreds of people were destitute. One life was lost. Heavy washouts occurred on the railroad east of Yuma. At San Diego, Cal., the telegraph lines were down and streams were running full.

On the 23d the upper Ohio River was falling, a rise was, however, reported at the headwaters of the Ohio. Immense damage had been caused and large areas continued under water along the Ohio River and tributaries. At Cincinnati, Ohio, the river reached 56 feet, and many houses were being abandoned in the submerged districts. At Louisville, Ky., the river rose slowly, reaching 27.7 feet in the canal at 5 p. m. Floods prevailed along the smaller streams of the Ohio Valley, and the Mississippi River was dangerously high from Memphis, Tenn., southward. All streams in Arizona were extremely high. At Yuma the river was 29 feet 6 inches in the morning, but had been higher during the night. At 9 a. m. the water on Main street had fallen about 3 feet below its highest point. All telegraph wires were down. In many parts of the territory the streams were higher than ever before known, and farms and irrigating ditches were badly washed. Floods and freshets prevailed in south California as the result of heavy rain. Railroad and telegraphic communication was generally cut off from Los Angeles, Cal. Washouts occurred and bridges were destroyed on the railroads. No material damage was done in the city of Los Angeles. The Los Angeles River washed away its banks in many places north of the city, destroying much valuable property. Considerable property was destroyed in the San Fernando Valley. South of the city the Los Angeles River changed its course, taking the old channel from which it was diverted during the storm of December, 1889, flooding the country and destroying much valuable property. The San Gabriel River was diverted into a new channel some distance above Duarte, making a current about 1,000 feet wide, which, rushing along with irresistible force, flooded the country below lower Duarte, and three persons were drowned. At Red Bluff, Cal., the Sacramento River rose 17 feet. On the 24th the river reached 57 feet at Cincinnati, Ohio, at 3 p. m.

On the 24th the Colorado River was rising at Yuma, Ariz., and the Salt and Gila rivers were rising rapidly. At Holbrook and Fort Thomas the rivers were the highest ever known, and much damage was caused. At Eagle Pass the Gila River was 7 feet above high-water mark; bottom lands along the Gila and San Francisco rivers were submerged; many lives were reported lost, and great destruction was done to farms, buildings, etc. Great destruction was caused to property and roads about San Carlos. Mountain streams near San Diego, Cal., were overflowing, and railroad communication was cut off. Along the lower Mississippi River the water stood at or near the danger-line in several places. On the 25th the river at Cincinnati, Ohio, became stationary at 57.4 feet at 6 p. m., and the water had risen 16 feet in 6 days. At Louisville, Ky., the river reached 31 feet, and the lower floors of houses in low-lying districts were flooded. The upper Ohio, Kanawha, and Big Sandy rivers were falling. At Chattanooga, Tenn., the Tennessee River stood at 29 feet, a rise of 13 feet in 4 days. At Nashville, Tenn., the Cumberland River reached 24.4 feet, a rise of 3 feet in 3 days. At Saint Louis, Mo., there had been a rise of 5 feet in 1 day. At Cairo, Ill., the stage of water was 44.3 feet and rising. High water was impending in the Mississippi River below Cairo. At Yuma, Ariz., the river rose gradually. At San Carlos the Gila River

had risen 2 feet during the night, and the Little Colorado continued high at Holbrook. A report from San Diego, Cal., stated that great damage was caused by flood in the Tia Juana Valley, where the water was the highest ever known.

On the 26th the river was falling slowly at Cincinnati, Ohio. At Louisville, Ky., the river was stationary at 32.3 feet. At Memphis, Tenn., the Mississippi River reached the danger-line, 33 feet, in the morning, and it was 1.9 foot above the danger-line at New Orleans, La. At Yuma, Ariz., the river rose rapidly, and at 8 p. m. had reached a point above the graduation on the gauge, and the reading at that hour was estimated 32 feet. The embankment on Main street which had been repaired again gave way in the afternoon and in a short time nearly every house on that street was in ruins. The water began to come in the quartermaster's property in the afternoon, and at midnight had nearly reached the signal office. At 10 p. m. the water in the Colorado River was running over the piers. At Albany, N. Y., the Hudson River was higher than in five years. In the Mohawk Valley, N. Y., the water was very high, and the tracks of the New York Central Railroad were blocked with water and ice between Fort Plain and Saint Johnsville. The train service was interrupted on the Hudson River Railroad at Poughkeepsie owing to heavy freshets in the upper Hudson, and the tracks between Scho-dack and Stuyvesant were covered with water and ice. In Saint Lawrence and Lewis counties, N. Y., flood submerged towns and carried away houses. Part of Binghamton, N. Y., was flooded by high water in the Susquehanna River.

On the 27th the river at Yuma, Ariz., reached its highest mark, 33.2 feet, at 1 a. m. at the railroad bridge, and was 4 feet 8 inches higher than ever before known. After that hour the river fell rapidly. The Signal Service observer at Yuma states that the river probably rose about 4 inches higher than the stage given, but owing to darkness the exact height could not be determined. On this date the rivers were stationary at Louisville, Ky., and Memphis, Tenn. In Arizona the rivers and small streams were falling. At Yuma the loss to citizens of that place by flood was estimated at over \$300,000, and the loss sustained by the railroads was immense. At the close of the month there had been no arrival or departure of trains since the 22d. On the 28th the river was 5.5 feet above the danger-line at Cairo, Ill., and was rising slowly. At Memphis, Tenn., the river was at the danger-line, and at Vicksburg, Miss., it was 2.2 above the danger-line.

ICE IN RIVERS AND HARBORS AND OPENING OF NAVIGATION.

Connecticut River.—Navigation was resumed at Essex, Conn., on the 11th, after having been closed about 6 weeks.

Hudson River.—The ice in the river below Newburgh, N. Y., was reported in a weakened condition on the 22d, and boats were preparing to resume their trips. On the 25th the heavy ice in the river at Albany, N. Y., broke up and moved down the river. From Newburgh to New York City navigation had been resumed.

Susquehanna River.—Navigation opened at Wilkes Barre, Pa., on the 23d; floating ice was reported at that point on the 3d and 5th to 7th. At Lock Haven, Pa., floating ice was reported on the 1st, 2d, and 5th.

Detroit River.—Floating ice was reported at Detroit, Mich., on the 6th, 8th, and 12th.

Black River.—Ice was broken up on the 24th and forced down the river, and a heavy jam was formed at Port Huron, Mich., on the 25th.

Saint Clair River.—Floating ice on the 13th at Port Huron, Mich.

Mississippi River.—At Dubuque, Iowa, the ice was quite firm on the 4th, and persons were crossing for the first time during the present winter. At Muscatine, Iowa, the river closed on the 4th; teams crossed on the 10th; and the river was clear of ice on the 15th. At Davenport, Iowa, the river froze over on the 4th; river clear of ice on the 18th; frozen over again on the 22d; and clear of ice on the 24th. At Warsaw,

Ill., the river was closed by a gorge 4 miles below that place on the 4th; gorge broken on the 11th. At Alton, Ill., floating ice was reported on the 4th to 6th, 10th, and 11th.

Missouri River.—Floating ice in the river at Leavenworth, Kans., on the 2d to 7th, 9th to 12th, 19th to 21st, and 25th to 28th. Ice in the river at Kansas City, Mo., 2d to 13th, 17th to 22d, 27th, and 28th. Running ice at Saint Joseph, Mo., 1st, 2d, 7th to 11th, 17th to 22d, 25th, 26th, and 27th; ice blocked at the draw in the bridge on the 28th. At Hermann, Mo., floating ice on the 4th to 6th and 16th.

Light drift ice was reported in the harbor at Portland, Me., on the 8th. Lake Champlain was clear of ice at Burlington, Vt., on the 1st, but was partially closed the latter part of the month. Navigation was obstructed by slush ice at Grand Haven, Mich., on the 3d to 6th, 9th and 10th.

Heights of rivers above low-water mark, February, 1891 (in feet and tenths).

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
Red River.						
Shreveport, La.	29.9	11, 13	25.2	28	21.5	3.7
Arkansas River.						
Fort Smith, Ark.	22.0	25	11.9	20	3.3	8.6
Little Rock, Ark.	23.0	27	14.5	20	8.1	6.4
Missouri River.						
Fort Buford, N. Dak. *						

Heights of rivers—Continued.

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
Missouri River—Continued.						
Kansas City, Mo.	21.0	23	7.5	5	2.8	4.7
Mississippi River.						
Saint Paul, Minn.	14.0					
La Crosse, Wis.	13.0					
Dubuque, Iowa	16.0					
Davenport, Iowa	15.0	21	5.2	1	1.1	4.1
Keokuk, Iowa	14.0	8	4.0	4	0.2	4.2
Saint Louis, Mo.	30.0	26, 27	11.5	9, 11	3.4	8.1
Cairo, Ill.	40.0	28	45.5	1	27.9	17.6
Memphis, Tenn.	33.0	26, 27, 28	33.0	1	19.0	14.0
Vicksburg, Miss.	41.0	28	43.2	2	28.2	15.0
New Orleans, La.	13.0	26	14.9	4, 5, 6, 7	11.0	3.9
Ohio River.						
Pittsburgh, Pa.	22.0	18	31.3	7, 15	9.2	22.1
Parkersburg, W. Va.	38.0	21	44.6	16	16.0	28.6
Cincinnati, Ohio	45.0	25	57.4	1	33.6	23.8
Louisville, Ky.	24.0	26	32.3	1	12.3	20.0
Cumberland River.						
Nashville, Tenn.	40.0	15	41.2	23	20.4	20.8
Tennessee River.						
Chattanooga, Tenn.	33.0	14	37.5	1	9.8	27.7
Knoxville, Tenn.	29.0	11	21.9	1.8	5.2	16.7
Monongahela River.						
Pittsburgh, Pa.	29.0	18	31.3	7, 15	9.2	22.1
Savannah River.						
Augusta, Ga.	32.0	9	27.2	16	13.1	14.1
Willamette River.						
Portland, Oregon.	15.0	15	5.7	5	1.3	4.4

* Frozen.

MISCELLANEOUS PHENOMENA.

SUN SPOTS.

Haverford College Observatory, Pa. (observed by Prof. F. P. Leavenworth):

Date.	Number of new		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.		Faculae.	Remarks.
	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.		
Feb., 1891.										
1, 2 p. m.	0	0	1	2	0	0	2	22	0	Definition fair; spots small.
2, 9 a. m.	1	1	0	0	0	0	0	10	1	Definition good; spots small.
4, 9 a. m.	0	0	1	0	0	0	0	0	1	Definition poor; spots small.
5, 9 a. m.	1	1	0	0	0	0	1	1	1	Definition poor; spots small.
6, 9 a. m.	0	0	0	0	0	0	1	2	2	Definition fair; spots small.
8, 10 a. m.	1	1	0	0	0	0	2	2	1	Definition good; spots small.
10, 10 a. m.	1	30	0	0	0	0	2	33	0	Definition fair.
11, 11 a. m.	1	33	0	0	0	0	3	65	0	Definition fair.
13, 3 p. m.	1	3	0	0	1	...	3	26	1	Definition good; 1 large spot.
14, 9 a. m.	1	3	0	0	0	0	4	32	1	Definition fair; 1 large spot.
15, 9 a. m.	0	32	0	0	0	0	4	54	2	Definition good; 1 large spot.
18, 9 a. m.	2	14?	0	0	0	0	5	36	4	Definition fair.
19, 11 a. m.	0	0	0	0	0	0	4	14	1	Definition bad.
22, 9 a. m.	2	30	0	0	0	0	6	55	3	Definition good; immense faculae.
23, 4 p. m.	0	0	0	0	0	0	4	45	1	Definition good.
24, 10 a. m.	0	0	0	0	0	0	3	28	1	Definition fair.
25, 10 a. m.	0	27	0	0	0	0	2	46	3	Definition fair.
27, 9 a. m.	1	2	1	0	0	0	2	25	1	Definition good.
28, 9 a. m.	0	0	0	0	0	0	1	18	1	Definition good; spots small.

Mr. D. E. Hadden, Alta, Iowa: 1st, 2 groups, 3 spots; groups n. latitude. 2d, 1 group, 1 spot. 3d, large group; faculae near nw. limb. 5th, 1 group, 1 spot, and faculae;

spots small sw. 6th, faculae. 7th, faculae on e., se., and w. limbs. 10th, 1 group, 10 spots, and faculae; group n. latitude e. of meridian. 11th, 2 groups; aurora preceding evening; 15 spots, and faculae; new group s. latitude; 4 large spots in group n. latitude; faculae on w. limb. 2 groups, 12 spots; brilliant faculae by rotation on se. limb. 13th, 3 groups, 12 spots, and faculae; new group se. 14th, 3 groups, 9 spots, and faculae; groups se., nw., and sw. 15th, 2 groups; large faculae by rotation on se. limb. 17th, 1 group about 2 days in on ne. limb; clouds; could not count spots; suspected aurora in the evening. 18th, 2 groups, 12 spots, and faculae; penumbra around spots in large group; other group, small, e. of larger group. 20th, 3 groups, 18 spots; large areas faculae by rotation on ne. limb. 21st, 3 groups, 12 spots, and faculae; large group unchanged; penumbra around spots. 23d, 3 groups, 9 spots; large faculae e., and near w. limb. 26th, 2 groups, 6 or 8 spots; faculae on nw. and w. limbs; groups near meridian n. latitude. 28th, 1 group, 2 spots; extensive groups faculae w.; spots in faculae. Cloudy 8th, 16th, 19th, 24th, 25th, and 27th.

Mr. John W. James, Riley, Ill: none seen till 11th, then 2 groups on sun's meridian in n. latitude. 12th, 2 new groups 1 day past meridian in s. latitude. 13th, 1 group new. 14th, 2 new spots in s. latitude w. of meridian; prominent faculae on se. edge of disc, followed next day by a large faint spot. 18th, 2 new groups in n. latitude; these were on sun's meridian 20th, and the largest spot in them disappeared by solar rotation 26th. 25th, 1 new group on sun's meridian in n. latitude. 27th, 28th, no spots seen.

Mr. H. D. Govey, North Lewisburgh, Ohio: sun spots were observed on the 10th, 11th, 13th, 14th, and 22d.

ATMOSPHERIC ELECTRICITY.

AURORAS.

Auroras were widely observed on the 9th, when they were noted in Ind., Iowa, Minn., S. Dak., and Wis.; on the 11th, when they were noted in Ill., S. Dak., Wis., Mich., Mass., N. H., and Me.; on the 12th, when they were noted in Me., Mass.,

Mich., and Mont.; and on the 14th, when they were noted in Ill., Mich., Mass., N. H., and Me. On the 11th, at 10.40 p. m., a brilliant aurora was observed at Portland, Me. It appeared as a whitish glow resting upon a dark segment, and reached altitude about 15°, and extended from 160° to 220° of azimuth.